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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/518,122	12/16/2004	Shouichi Miyawaki	1141/73570	3286

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EXAMINER	
SHIPMAN, JEREMIAH E	

ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 03/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/518,122	MIYAWAKI ET AL.	
	Examiner	Art Unit	
	Jeremiah Shipman	2859	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12/16/04*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) *14* is/are withdrawn from consideration.

5)☒ Claim(s) *15-21* is/are allowed.

6)☒ Claim(s) *1-11 and 13/11* is/are rejected.

7)☒ Claim(s) *12 and 13/12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 December 2004* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/16/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Specification

1. A substitute specification in proper idiomatic English and in compliance with 37 CFR 1.52(a) and (b) is required. The substitute specification filed must be accompanied by a statement that it contains no new matter.

Claim Objections

2. Claim 14 is objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot depend from any other multiple dependent claim (in this case, claim 13). See MPEP § 608.01(n). Accordingly, the claim has not been further treated on the merits.

3. Claims 17 and 18 are objected to because of the following informalities:

Regarding claim 17, the phrase "a group of" should be deleted in the recitation on lines 24-25 of the claim (lines 1-2 on page 39) of "a group of a first pulse sequence group in which..."

Regarding claim 18, the claim ends with the phrase "...among the second pulse sequence and. ".

4. Appropriate correction is required.

Claim Rejections - 35 USC § 102

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 6, and 9-10 are rejected under 35 U.S.C. 102(e) as being anticipated by Weissenberger (US 6,335,620; filed 21 December 1999).

Regarding claim 1, Weissenberger describes a magnetic resonance imaging apparatus (col 1, lines 10-13) comprising a phantom disposed in a static magnetic field (col 3, lines 3-5), an eddy current measurement means which takes an image of the phantom (col 2, lines 64-67) by repeatedly executing an eddy current measurement sequence composed of an application of a test gradient magnetic field having an application time longer than the time constant of an eddy current as a measurement object (col 4, lines 33-36) and having a predetermined intensity in a predetermined axial direction (Fig 2, "GM") and of a repetition in a plurality of times of a pulse sequence which is started in response to rising up or falling down of the test gradient magnetic field (col 1, lines 39-51; Fig 1-4) while changing the phase encoding amount thereof (col 4, lines 59-61) and successively measures a plurality of image data containing magnetic field variation information due to eddy current induced by rising up for falling down of the test gradient magnetic field in a unit of the repetition time of the pulse sequence (col 1, lines 39-51; col 5, lines 19-24, 66-67), and compensation current calculating means which determines from the image data obtained in the repetition time of a current value to be caused to flow in a magnetic field compensation coil at a time when taking an image of the subject and compensating the eddy current (col 6, lines 22-42).

Regarding claim 6, the test gradient magnetic field of Weissenberger is applied in its actual value (Fig 2).

Regarding claim 9, Weissenberger teaches that the pulse sequence repeatedly executed is a gradient echo sequence (col 4, lines 36-43).

Regarding claim 10, Weissenberger further teaches that the eddy current measuring is performed by separately applying the test gradient magnetic fields in three orthogonal axes of gradient magnetic field application directions (col 6, line 65 through col 7, line 3).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 2, 5, 11, and 13/11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weissenberger in view of Zhou (US 5,770,943).

Regarding claims 2 and 11, Weissenberger discusses the MRI apparatus discussed above in paragraph 5, but does not teach the eddy current measurement means executing the eddy current measurement sequence in both positive and negative polarities of test magnetic field and performing subtraction between the image data obtained.

Regarding claim 5, Weissenberger does not teach the image data containing the magnetic field variation information being phase image data.

Zhou teaches an MRI apparatus with gradient eddy current compensation similar to that of Weissenberger (col 1, lines 8-12; col 2, lines 48-56), but with the additional feature of conducting the measurement twice at opposite polarities (col 5, lines 50-58), reconstructing the data into phase images (col 3, lines 16-18), and subtracting the corresponding phase images (col 6, lines 7-14) in order to offset effects other than the eddy currents being studied.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use this bipolar compensation technique using phase images taught by Zhou in the apparatus of Weissenberger in order to achieve the advantages sought by Zhou, namely more effective eddy current compensation by eliminating from consideration effects not due to the eddy currents themselves but to other causes (such as B_0 inhomogeneities; col 5, lines 52-58; col 3, lines 5-8).

Regarding claim 13/11, the measurement of Weissenberger is performed and measurements taken on the pulse sequence group including the test gradient magnetic field (Fig 1-4; col 5, lines 6-24), and the calculation includes eddy currents induced by the rising up of the test gradient magnetic field (col 1, lines 39-47; additionally, the rise-up and fall-down eddy currents are generally equal and opposite, so a measurement of one is generally sufficient to determine both).

8. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weissenberger in view of Conturo (US 5352979). Weissenberger teaches the MRI apparatus discussed above in paragraph 5, but does not teach the use of a steady-

state-free-precession pulse sequence used in succession with the pulse sequence for taking images of the phantom.

Conturo describes a MRI apparatus with gradient eddy current compensation by manipulation of phase images similar to that of Weissenberger (col 11, lines 1-38), but which makes use of the SSFP method (col 4, line 55). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the SSFP sequence in conjunction with the apparatus taught by Weissenberger, as suggested by Conturo, in order to gain the conventional advantages of the SSFP sequence, such as its capability to produce images with T_2^* weighting.

9. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weissenberger in view of Cohen ("EPI and fMRI", 1998). Weissenberger teaches the MRI apparatus including an applied test gradient as described above in paragraph 5, but does not teach the test gradient being applied as an effective gradient contained in the form of pulse like gradient magnetic fields repeatedly executed. Cohen teaches that it is known in the art to break a gradient up into pulse like segments for generating an effective gradient without leaving the gradient on for an extended duration, as is done in echo planar imaging (Fig 4, the later acquisitions experience an effective gradient that is formed by the cumulative action of all prior gradient field pulses; p 4, lines 19-24). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use this effective gradient technique known in the art and discussed by

Cohen in the MRI apparatus of Weissenberger, for the conventional advantages of such a substitution, such as the potential for faster imaging (Cohen, p 4, lines 19-24).

Allowable Subject Matter

10. Claims 12 and 13/12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. Claims 15-21 are allowed.

12. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 12, 13/12, and 15-16, the prior art of record does not teach or fairly suggest an MRI apparatus with a calibration pulse sequence which includes applying a test gradient magnetic field after causing an echo signal to be generated through application of a high frequency excitation pulse and application of a phase encoding gradient field and a readout gradient field, in combination with the other limitations of the claims.

Regarding claims 17-21, the prior art of record does not teach or fairly suggest the use of the second and fourth pulse sequence groups, in which the application of the test gradient field is removed, in combination with the other limitations of the claims.

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeremiah Shipman whose telephone number is (571)272-8439. The examiner can normally be reached on Monday-Friday, 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on (571)272-2245. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JS

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